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MoS₂ Vertically Grown on Graphene with Efficient Electrocatalytic Activity in Pt-free Dye-Sensitized Solar Cells

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Abstract

In this report, MoS₂ nanosheets grown vertically on reduced graphene oxide (MoS₂@RGO) were successfully prepared via a facile hydrothermal process, and then worked as counter electrode (CE) in dye-sensitized solar cells (DSSCs). The MoS₂@RGO materials revealed enhanced electrocatalytic activity and stable chemical property for accelerating the reduction of I⁻/I₃⁻ redox couple. Cyclic voltammograms (CV) showed that the peak current density (J_A) and peak spacing (E_{pp}) of MoS₂@RGO CE were smaller than Pt, MoS₂, and RGO in DSSCs, owing to the superior carrier transfer properties of graphene, abundant catalytic active sites and low resistance of MoS₂@RGO. Furthermore, the power conversion efficiency (PCE) of MoS₂@RGO CE reached 6.82%, which is higher than that of Pt CE (6.44%). Electrical impedance spectroscopy (EIS) and tafel polarization were also investigated to demonstrate positive synergetic effect between MoS₂ and RGO, as well as efficient electrocatalytic performance in Pt-free DSSCs.

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